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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/527,789

08/09/2005

Matthias Aikele

4856 / PCT

9555

21553 7590 11/24/2009
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EXAMINER

ALANKO, ANITA KAREN

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

11/24/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/527,789	Applicant(s) AIKELE ET AL.	
	Examiner Anita K. Alanko	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 August 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 7-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 7-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

The indicated allowability of claims 1-3, 7-9 is withdrawn in view of the newly discovered references to Shaw et al, MacDonald et al and Zhang et al. Rejections based on the newly cited references follow.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-3 and 7-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1, line 10, the term “up to” is indefinite. Does the claim require complete conversion, or may there be present less than complete conversion?

In claim 7, line 3, the term “longer” is a relative term. Compared to what is the structure longer?

In claim 8, line 2, the term “greater” is a relative term. Compared to what is the width greater?

Claims 2-3 and 9 fail to cure the indefiniteness of the base claim, and are therefore also rejected.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3 and 8-9 are rejected under 35 U.S.C. 102(b) as being anticipated by Shaw et al (US 5,426,070).

Shaw discloses a process for the fabrication of isolation structures (“isolating region” col.13, lines 20-25) with the following process steps

provision of a semiconductor substrate 10 (Fig.1A),

forming of at least two trenches (Step 5, Fig.1E, Fig. 2) spaced apart from each other in the semiconductor substrate with at least one rib 52, 54 56 (See Fig.2, col. 13, lines 22-32) positioned between the trenches,

conversion of the substrate material in the area of the trenches (Fig.4A-4C) into an electrically insulating material 64, 66 up to the complete conversion of the rib 66 arranged between them (col.13, lines 42-67, col.14, lines 3-9, 32-35),

forming of a functional structure (beam 50) within the substrate material which is mechanically connected with the substrate material exclusively by means of the converted substrate material which is formed at the trenches (Fig.4D).

As to claim 2, Shaw discloses a silicon substrate 10 (col.8, line 60).

As to claim 3, Shaw discloses conversion by thermal oxidation (col.13, lines 42-44).

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As to claims 8-9, Shaw discloses to separate conductive portions of a beam from the surrounding substrate 58 (col.13, lines 32-34) by providing an oxidized isolating region comprising a first thermal oxidation (Step 6, Fig.4A, col.13, lines 42-67), removing the so created converted material (Step 8, Fig.4B, col.14, lines 17-20), and thereafter the remaining material is converted in a second process step of conversion (Step 9, Fig.4C, col.14, lines 24-35).

Claims 1-3 and 7-9 are rejected under 35 U.S.C. 102(b) as being anticipated by MacDonald et al (US 5,628,917).

MacDonald discloses a process for the fabrication of isolation structures with the following process steps

provision of a semiconductor substrate 10 (Fig.1a),

forming of at least two trenches 21 (Fig.1k) spaced apart from each other in the semiconductor substrate with at least one rib 28 positioned between the trenches,

conversion of the substrate material in the area of the trenches (Fig.1l) into an electrically insulating material with the complete conversion of the rib arranged between them (Fig.1i & 1n, col.5, lines 52-56, 66-67),

forming of a functional structure (growing of mirrors together, Fig.7b, col.7, lines 59-61) within the substrate material which is mechanically connected with the substrate material exclusively by means of the converted substrate material which is formed at the trenches (since it is released from the substrate).

As to claim 2, MacDonald discloses a silicon substrate 10 (col.5, line 20).

As to claim 3, MacDonald discloses conversion by thermal oxidation (col.5 lines 46, 52-56).

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As to claim 7, MacDonald discloses a continuous insulating oxide over longer distances (Fig.7b) created by a continuous arrangement of trenches and ribs between them (Fig.7a-7b, col.7, lines 56-61).

As to claims 8-9, MacDonald discloses conversion as a multi-step process including after a first conversion (“partial thermal silicon dioxide” col.5, line 46), the so created converted material is removed (BHF, col.5, lines 49-50, Fig.1h), and thereafter the remaining material is converted in a second process step of the conversion (“another thermal silicon dioxide” col.5, lines 52-56).

Claims 1-3 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Zhang et al (US 5,506,175).

Zhang discloses a process for the fabrication of isolation structures (“suitable insulating segments” col.5, lines 8-14) with the following process steps

provision of a semiconductor substrate 12 (Fig.1, col.4, line 56),

forming of at least two trenches (Fig.4(b), Cross Section B, trenches are inherent since multiple segments are formed within cavity 14; silicon etch, col.9, lines 15-24) spaced apart from each other in the semiconductor substrate with at least one rib 244 positioned between the trenches,

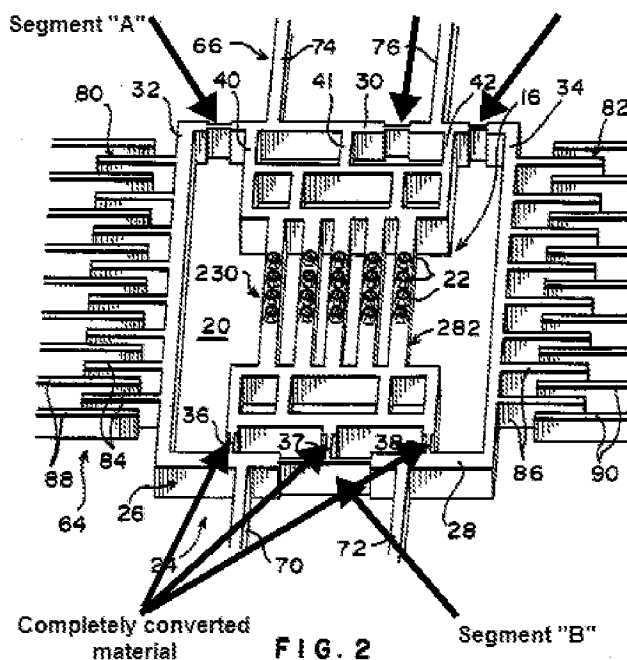
conversion of the substrate material in the area of the trenches (Fig.4c) into an electrically insulating material 246 with complete conversion of the rib 250 arranged between them (col.9, lines 27-42),

forming of a functional structure (e.g., emitters 22 on central stage portion 16, col.4, lines 57-63) within the substrate material which is mechanically connected with the substrate material exclusively by means of the converted substrate material which is formed at the trenches (exact location 36, 37, 38 depends on where electrical isolation is desired, marked by arrows in Fig.2).

As to claim 2, Zhang discloses a silicon substrate 12 (col.4, line 56).

As to claim 3, Zhang discloses conversion by thermal oxidation (col.9, lines 27-29).

As to claim 7, Zhang discloses a continuous insulating oxide (marked by arrows in Fig.2) over longer distances (for example, segment "B" and 37, connecting 70 and 72, is longer than the segment "A" connecting 32 and 30) created by a continuous arrangement of trenches and ribs between them (see Fig.2).



Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al (US 5,506,175) in view of Shaw et al (US 5,426,070).

The discussions of Zhang and Shaw from above are repeated here.

As to claims 8-9, Zhang fails to disclose to have a multi-step thermal conversion process. Shaw teaches a method to separate conductive portions of a beam from the surrounding substrate 58 (col.13, lines 32-34) by providing an oxidized isolating region comprising a first thermal oxidation (Step 6, Fig.4A, col.13, lines 42-67), removing the so created converted material (Step 8, Fig.4B, col.14, lines 17-20), and thereafter the remaining material is converted in a second process step of conversion (Step 9, Fig.4C, col.14, lines 24-35). The advantage of having a multi-step conversion process is to enable complete conversion of thicker regions, to selectively place isolated regions where they are desired in order to form the final MEMS device (col.12, lines 44-50), and to improve the timing of the process (col.14, lines 3-9).

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It would have been obvious to one with ordinary skill in the art to have a multi-step conversion process as cited in the method of Zhang because Shaw teaches that this is useful to improve the timing of the process, and saving time saves money.

Response to Amendment

The objection to the specification is withdrawn since the abstract has been amended to be limited to a single paragraph. The removal of the "black dot" from the claims is acknowledged and appreciated.

Applicant's arguments with respect to claims 1-3 and 7-9 have been considered but are moot in view of the new ground(s) of rejection. Shaw, MacDonald and Zhang are all newly cited to show conversion of ribs into electrically insulating material to form isolation structures, and forming of a functional structure mechanically connected with the substrate exclusively by the converted substrate material which is formed at the trenches.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The cited art shows more methods of thermal conversion of silicon ribs.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K. Alanko whose telephone number is 571-272-1458. The examiner can normally be reached on Mon-Fri until 3:30 pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Anita K Alanko/
Primary Examiner, Art Unit 1792